VARIABLE RAMP ASSEMBLIES AND SYSTEM THEREFOR

FIELD OF THE INVENTION

[0001] The present invention relates to ramps for providing aerial lift for sport jumping with skateboards, inline skates, bicycles and the like and, more particularly, a system for creating ramp assemblies that can be readily assembled to selectively provide obstacle courses of a variety of configurations with different challenge levels and can be readily disassembled for transport or storage.

BACKGROUND OF THE INVENTION

[0002] There are a variety of ramp designs for skateboard, inline skates and bicycle enthusiasts for performing simple aerial jumps or complex aerial acrobatics or other forms of ramp challenges. Such activities are generally performed on straight inclined ramp surfaces or arcuate surfaces some of which may extend as much as a half pipe. In addition there are collapsible and/or modular ramp assemblies some of which are used for the transport of wheeled vehicles such as wheelchairs, carts and the like.

[0003] Even with prior modular or collapsible ramp assemblies such structures provide only limited, selective versatility of the final desired configuration and hence use.

[0004] In the present invention a system for modular ramp assemblies is provided comprising a plurality of similar ramp modules of at least two different structures which can be selectively assembled together vertically and horizontally to define ramp assemblies having a variety of desired overall configurations. Here one of

the modules is an inclined ramp module having an inclined upper support, or riding surface and another module a straight module having a straight, flat upper support or riding surface. These surfaces are adapted to be readily operatively joined together to form configurations with desired contours.

[0005] With the versatile system of the present invention the modules can be selectively assembled to provide ramp assemblies of multiple lengths, multiple widths and multiple ramp elevations along with a large variety of overall contours. In addition the modules are provided with unique interfitting structures whereby the modules can be readily manually assembled and disassembled without the need for special tools. In addition each module is of a relatively lightweight structure to facilitate handling.

SUMMARY OF THE INVENTION

[0006] In the present invention, a unique modular ramp system is provided to permit the user to selectively vary the overall contour of the ramp assembly as finally assembled.

[0007] Here a plurality of modules of at least two different configurations are used. A first module is provided with an inclined upper support or riding surface with the inclined surface extending substantially over the entire upper surface. A second module is substantially rectangular having a straight, generally horizontal planar upper support or riding surface extending substantially over the entire upper surface.

[0008] In one form the first and second modules are of substantially the same width and length. In addition the upper end of the inclined surface of the inclined ramp module is of substantially the same height as the uniform height of the rectangular

module to provide continuity between the support surfaces when operatively connected together in line. This then facilitates assembly of the modules together in a large variety of selected configurations.

[0009] In addition, a simple, unique structure is provided for selectively interconnecting the modules together length wise (end-to-end), width wise (side-by-side), width-to-length (end-to-side) and/or stacked one on top of the other. This simple structure facilitates an ease of assembly and disassembly of the modules into a variety of overall structural ramp assemblies.

[0010] At the same time the capability of providing a selective variety of configurations of ramp assemblies can be done with the use of modules of only two different structures. This then minimizes the overall cost of manufacture for a reasonable cost to the end user.

[0011] Therefore, it is an object of the present invention to provide ramp modules of unique structures for facilitating the formation of ramp assemblies of different overall contours.

[0012] It is another object of the present invention to provide a modular ramp system having a plurality of ramp modules which can be connected together horizontally and vertically in a variety of ways to provide ramp assemblies of numerous, selectively desirable overall contours.

[0013] It is another object of the present invention to provide a modular ramp system including a plurality of ramp modules of different constructions with a structure facilitating relatively easy assembly and disassembly.

[0014] It is another object of the present invention to provide a modular ramp system including a plurality of ramp modules of two different structures to provide ramp assemblies of selectively desirable contours.

[0015] It is also an object of the present invention to provide ramp modules of unique structures for forming unique structural ramp assemblies.

[0016] It is still another object of the present invention to provide a unique modular ramp system.

[0017] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0019] FIG. 1 is a perspective view of one form of a ramp assembly including inclined ramp modules having an inclined, straight upper riding or support surface and straight modules having a straight, planar, generally horizontal upper riding or support or surface;

[0020] FIG. Ia is an enlarged fragmentary view of a portion of the ramp assembly taken generally in the Circle 1a in FIG. 1;

[0021] FIG. 2 is a perspective view similar to FIG. 1 with a number of inclined ramp modules and straight ramp modules shown in phantom and illustrating different possible horizontal and vertical interconnections between modules for forming a variety of different ramp assemblies;

[0022] FIG. 3 is an upper perspective view of an inclined ramp module with T-shaped connecting protrusions and T-shaped connecting grooves for connection with other ramp modules;

[0023] FIG. 3a is a longitudinal sectional view along the length of the inclined ramp module of FIG. 3 and taken generally along the line and in the direction of the Arrows 3a-3a in FIG. 3;

[0024] FIG. 4 is a front end elevational view of the inclined ramp module of FIG. 3 taken in the direction of the Arrows 4-4 in FIG. 3;

[0025] FIG. 5 is an enlarged fragmentary view with some parts shown in section of the portion of the inclined ramp module of FIG. 4 taken generally in the Circle 5 in FIG. 4;

[0026] FIG. 6 is a side elevational view of the inclined ramp module of FIG. 3 taken in the direction of the Arrows 6-6 in FIG. 3;

[0027] FIG. 7 is an upper perspective view of a straight ramp module with T-shaped connecting protrusions and T-shaped connecting grooves for connection with other ramp modules;

[0028] FIG. 7a is a longitudinal sectional view along the length of the straight ramp module of FIG. 7 and taken generally along the line and in the direction of the Arrows 7a-7a in FIG. 7;

[0029] FIG. 7b is a transverse sectional view along the width of the straight ramp module of FIG. 7 and taken generally along the line and in the direction of the Arrows 7b-7b in FIG. 7;

[0030] FIG. 7c is an enlarged, fragmentary sectional view of a bottom portion of the straight ramp module of FIG. 7 taken generally in the Circle 7c in FIG. 7b depicting the slip resistant foot member as applied to the bottom end of one of the side walls of the straight ramp module;

[0031] Figure 7d is an enlarged end elevational view of the foot member of FIG. 7c;

[0032] FIG. 8 is an end elevational view of the straight ramp module of FIG. 7 taken in the direction of the Arrows 8-8 in FIG. 7;

[0033] FIG. 9 is a side elevational view of the straight ramp module of FIG. 7 taken in the direction of the Arrows 9-9 in FIG. 7;

[0034] FIG. 10 is a front, upper perspective view of a connector for securing the ramp modules together when stacked vertically;

[0035] FIG. 11 is a front elevational view of the connector of FIG. 10;

[0036] FIG. 12 is an exploded, fragmentary view showing the layered connection prior to assembly between a straight ramp module on the bottom and an inclined ramp module on top with connectors of FIGS. 10 and 11 for securing the ramp modules together;

[0037] FIG. 13 is a fragmentary pictorial view to enlarged scale taken generally in the Circle 13 in FIG. 1 and showing the layered connection of a straight

ramp module on the bottom and an inclined ramp module stacked on top of the straight ramp module and secured together with the connector of FIGS. 10 and 11;

[0038] FIG. 14 is a fragmentary sectional view of the layered connection between the straight and inclined ramp modules by the connector of FIGS. 10 and 11 taken generally along the line and in the direction of the Arrows 14-14 in FIG. 13;

[0039] FIG. 15 is a fragmentary vertical sectional view to enlarged scale of the confronting surfaces of the T-shaped protrusion of the lower inclined ramp module and the T-shaped groove of the adjacent lower straight module of FIG. 2 when connected together and taken generally along the line and in the direction of the Arrows 15-15 in FIG. 2, with the section line in the direction of Arrows 15'-15' in FIG. 2 providing a view which would be a mirror image of FIG. 15 and thus that view has been omitted for purposes of simplicity;

[0040] FIG. 16 is a fragmentary view to enlarged scale of the T-shaped connecting protrusion of the straight ramp module of FIG. 8 taken generally in the Circle 16 in FIG. 8;

[0041] FIG. 17 is a fragmentary view to enlarged scale of the T-shaped connecting groove of the straight ramp module of FIG. 8 taken generally in the Circle 17 in FIG. 8;

[0042] FIG. 18 is a fragmentary view to enlarged scale taken generally vertically downwardly in the direction of the Arrows 18-18 in FIG. 2 depicting the upper end of the connection between a T-shaped connecting protrusion on the straight ramp module and a T-shaped connecting groove on the inclined ramp module; and

[0043] FIG. 19 is a fragmentary view depicting the T-shaped protrusion and T-shaped groove of FIG. 18 separated prior to assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0044] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0045] Looking now to Figure 1, a modular ramp assembly 10, of one form, is shown and is made up of a plurality of inclined ramp modules 12 of one uniform structure and straight ramp modules 14 of a second uniform structure. The inclined ramp modules 12 are generally of a right triangular, wedge shape while the straight ramp modules 14 are generally of a rectangular box shape. Both the inclined ramp modules 12 and straight ramp modules 14 are of a generally lightweight, hollow construction to be described.

[0046] Figures 3, 4 and 6 show the inclined ramp module 12, to have an inclined, straight, planar rectangular upper support or riding surface 16 supported on opposite sides by generally triangularly shaped side walls 18a and 18b and at the upper end by a generally rectangularly shaped end wall 20. The side wall 18a has a plurality of longitudinally spaced T-shaped connecting protrusions 22a and 24a and a plurality of longitudinally spaced T-shaped connecting channel grooves 26a and 28a. As can be seen the connecting protrusions 22a and 24a are alternately spaced relative to the connecting channel grooves 26a and 28a. The opposite side wall 18b has T-shaped connecting protrusions 22b and 24b which are longitudinally offset from the opposite

sided connecting protrusions 22a and 24a and are substantially in transverse alignment with the T-shaped channel grooves 26a and 28a, respectively. Likewise, the side wall 18b has T-shaped channel grooves 26b and 28b which are substantially in transverse alignment with the T-shaped protrusions 22a and 24a, respectively. Such alignment serves a connecting purpose to be described. The end wall 20 has a T-shaped connecting protrusion 30 and a T-shaped connecting channel groove 32. Figure 5 is a fragmentary partially sectioned view depicting the upper end of the T-shaped protrusion 24a.

[0047] Figures 7, 8 and 9 show the straight ramp module 14.

[0048] As will be seen the T-shaped protrusions and T-shaped grooves provide a unique and simple way of slidably connecting the ramp modules to form assemblies of a variety of horizontal and vertical configurations.

[0049] The straight ramp module 14 has a generally horizontal rectangular, straight or planar upper riding or support surface 34 which is supported on opposite sides by generally rectangularly shaped side walls 36a and 36b and at opposite ends by generally rectangularly shaped front and rear end walls 38a and 38b, respectively. The side wall 36a has a pair of longitudinally spaced T-shaped connecting protrusions 40a and 42a and a plurality of longitudinally spaced T-shaped connecting channel grooves 44a and 46a. Again, the connecting protrusions 40a and 42a are alternately spaced relative to the connecting channel grooves 44a and 46a. The opposite side wall 36b has T-shaped connecting protrusions 40b and 42b which are longitudinally offset from the opposite side protrusions 40a and 42a and are substantially in transverse alignment with the T-shaped channel grooves 44a and 46a.

Likewise the side wall 36b has T-shaped connecting channel grooves 44b and 46b which are longitudinally offset from the opposite side channel grooves 44a and 46a and are substantially in transverse alignment with the T-shaped protrusions 40a and 42a, respectively.

[0050] The front end wall 38a has a T-shaped connecting protrusion 48a and a transversely spaced T-shaped connecting channel groove 50a. The rear end wall 38b has a T-shaped connecting protrusion 48b in longitudinal alignment with the T-shaped channel groove 50a and a transversely spaced T-shaped connecting channel groove 50b in longitudinal alignment with the T-shaped protrusion 48a.

[0051] In all of the above, the T-shaped protrusions and T-shaped grooves on the inclined ramp modules 12 and on the straight ramp modules 14 are of similar constructions and equally spaced with the T-shaped protrusions adapted to slidingly fit within the T-shaped channel grooves to connect an inclined module 12 and straight ramp module 14 together end-to-end. In this regard the shortened T-shaped protrusions 22a, b and 24a, b and shortened T shaped channel grooves 26a, b and 28a, b of the inclined ramp modules 12 are of substantially the same contour as the full length T-shaped protrusion 30 and channel groove 32 at their same lower sections.

[0052] At the same time, the transverse spacing between the protrusion 30 and channel groove 32 in the end wall 20 of inclined ramp modules 12 and between the end protrusions 48a and 48b and end channel grooves 50a and 50b in end walls 38a and 38b of the straight ramp modules 14 is inversely the same to provide interfitting end-to-end connection. Also the longitudinal spacing between the side protrusions 22a, 24a and side channel grooves 26b, 28b and side protrusions 22b, 24b and side channel

grooves 26a, 28a in side walls 18a, 18b of the inclined ramp modules 12 is inversely the same to provide interfitting side-by-side connection between two inclined ramp modules.

[0053] Along the same line, the protrusion 48a and channel groove 50a in the end wall 38a of the straight ramp modules 14 are longitudinally in line with the channel groove 50b and protrusion 48b, respectively, in the opposite end wall 38b to provide end-to-end connection. Also the longitudinal spacing between the channel grooves 44a, 46a on side wall 36a and protrusions 40b, 42b on side wall 36b is the same placing them in transverse alignment and the spacing between protrusions 40a, 42a on side wall 36a and channel grooves 44b, 46b is the same also placing these in transverse alignment to provide interfitting side-by-side connection between two straight ramp modules 14.

[0054] In this regard, it can be seen from Figure 2 that the inversely uniform spacing of T-shaped connecting grooves and T-shaped connecting projections on the end and side surfaces of the inclined ramp modules 12 and straight ramp modules 14 are uniform whereby the end wall 20 of the inclined ramp module 12 can also be connected to either of the side walls 36a, 36b of the straight ramp modules 14 and likewise either end wall 38a, 38b of a straight ramp module 14 can be connected to either of the side walls 36a, 36b of another straight ramp module 14. Thus the inclined ramp modules 12 and straight ramp modules 14 can be connected together in a substantial variety of vertical and horizontal combinations. Examples of such variations in assembly are shown in FIG. 2 with some members shown in phantom. In this regard, it can be seen in Figure 2 that ramp assemblies can be selectively erected with inclined ramps 12 at the beginning and end such that there may be little or no aerial left. This

clearly shows that ramp assemblies can be assembled to provide obstacle courses of a selected variety of challenge levels. It can also be seen then that the orientation of the T-shaped projections and T-shaped grooves of the inclined ramp modules 12 and straight ramp modules 14 facilitates the ease of assembly since no particular orientation is required for end-to-end or side-to-side connection.

[0055] As can be seen from Figure 1, the width and height of the end wall 20 of the inclined ramp modules 12 and of the end walls 38a and 38b of the straight ramp modules 14 are the same such that an inclined ramp module 12 and straight ramp module 14 are in an in-line alignment when assembled end-to-end. In addition the lengths of the inclined ramp modules 12 and the straight ramp modules 14 are the same to provide alignment for vertical stacking when an inclined ramp module 12 is stacked on top of a straight ramp module 14.

[0056] In order to secure the different ramp modules together for vertical stacking a separate connecting member is provided. Looking now to FIGS. 10 and 11 a connector 52 is shown and is of a generally open structure having an inner substantially enclosed portion 54 having an opening 56 at its lower end and a closed cap portion 58 at its upper end. A generally U-shaped, open flanged, channel 60 extends outwardly from the forward side. The connector 52 has an upper section 62 and a lower section 64. The lower section 64 is somewhat larger transversely than the upper section 62 to define an outer alignment and stop ridge 66 which serves a purpose to be described.

[0057] The T-shaped connecting protrusions, such as 22a, 24a, and T-shaped channel grooves, such as 26a, 28a, are uniquely constructed for connecting the inclined ramp modules 12 and straight ramp modules 14 together, side-by-side or end-

to-end. At the same time the connectors 52, T-shaped protrusions and T-shaped channel grooves are uniquely constructed for providing connections between the inclined ramp modules 12 and straight ramp modules 14 for vertical stacking.

[0058] All of the T-shaped projections and T-shaped channel grooves are of an identical configuration and construction except for the shortened T-shaped protrusions 22a, b and 24a, b and shortened T-shaped channel grooves 26a, b and 28a, b on the side walls 18a, 18b of the inclined ramp modules 12. However, the configuration of the shortened T-shaped projections and T-shaped grooves are the same as the corresponding lower portions of the full length T-shaped projections and T-shaped grooves.

[0059] A representative example of the structure of the full length T-shaped protrusions and T-shaped channel grooves can be seen in Figure 16 which is of the T-shaped protrusion 48a and Figure 17 which is of the T-shaped channel groove 50a. These views are taken from Figure 8 which, as can be seen, is at the front end wall 38a of the straight ramp module 14. Other features of the T-shaped protrusions 48a and of the T-shaped channel groove 50a can be seen in Figures 12,15,18 and 19.

[0060] Looking now to Figures 16, 18 and 19 the T-shaped protrusion 48a is of a tapered construction with a narrower upper end 68 tapering to a wider lower end 70. The protrusion 48a has an outer rectangular section 72 connected to the end wall 38a by a narrower neck section 74. The rectangular section 72 and neck section 74 are similarly tapered and in one form of the invention the taper angle A was selected to be around 1.5°. As can be seen in Figure 12, the protrusion 48a is of a hollow construction with the neck section 74 opening into the generally hollow interior of the straight ramp

module 14. The T-shaped protrusion 48a is closed at the upper end 68 and open at the lower end 70. In this regard, the shorter T-shaped protrusions on the side walls 18a and 18b of the inclined ramp module 12 are also hollow and closed at their upper ends as can be seen with the T-shaped protrusion 24 in Figure 5.

[0061] Looking now to Figures 17, 18 and 19, the T-shaped channel groove 50a is also of a tapered construction but which is of a reverse taper relative to that of the T-shaped protrusion 48a. Thus the channel groove 50a tapers from a wider upper end 76 to a narrower lower end 78. The T-shaped channel groove 50a has an outer, slotted narrow neck section 80 connected to a wider inner rectangular groove section 82. The rectangular groove section 82 is closed at its inner surface 84 whereby the channel groove 50a is not open to the hollow interior of the straight ramp module 14. As can be seen in Figure 17, the neck section 80 and rectangular groove section 82 are similarly tapered at an angle AA of around 1.5° which is thus substantially the same as the reverse taper angle A of the T-shaped protrusion 48a.

[0062] Looking now to Figures 18 and 19, the size of the T-shaped protrusion 48a at its wider lower end 70 is substantially the same as the size of the T-shaped channel groove 50a at its narrower lower end 78 to provide mating engagement at the location. However, the size of the narrower upper end 68 of the T-shaped protrusion 48a is less than the size of the wider upper end 76 of the T-shaped channel groove 50a to provide a preselected clearance for a purpose to be seen.

[0063] Figure 15 shows the vertical relationship of the T-shaped protrusion 48a when interconnected into the T-shaped channel groove 50b. Here it can be seen that the outer rectangular section 72 is angled inwardly lengthwise from the lower end

70 to the upper end 68 at an angle B. The inner surface 84 of the rectangular groove section 82 of the T-shaped groove 50a is also angled inwardly lengthwise from the lower end 78 to the upper end 76 at angle BB. Here in one form of the invention the angle B was set at around .75° while the angle BB was also set at around .75°. This provides a preselected clearance at the upper ends 68, 76 while the lower ends 70, 78 are in mating engagement.

[0064] The noted clearances facilitate assembly of the ramp modules together for horizontal in-line connection, i.e. end-to-end, side-to-side or end-to-side. The clearance also facilitates assembly of the ramp modules in a variety of vertically stacked relationships. In addition while the tapers and inclinations of the T-shaped protrusions 48a and T-shaped channel grooves 50a facilitate assembly they also facilitate manufacture by assisting in ejection of the modules from the molds in the molding process.

[0065] As noted in order to securely stack one ramp module upon another, the connectors 52 are used. This can be seen in Figures 12-14 where an inclined ramp module 12 is being stacked upon a straight ramp module 14. First each of the connectors 52 is located over the upper end 68 of the T-shaped protrusions such as protrusions 42a and 48a. Here the lower section 64 of the connector 52 will fit snugly on the upper end 68. With the connectors 52 in place next the inclined ramp module 12 is placed on top of the straight ramp module 14 with the T-shaped protrusion 24a on the side wall 18a and protrusion 30 on the end wall 20 in line with the T-shaped protrusion 42a on the side wall 36a and the T-shaped protrusion 48a on the front end wall 38a. The opening at the lower end 70 of the T-shaped protrusion 48a is of a contour to move

over the upper section 62 of the connector 52 with the bottom side of the lower end 70 of the T-shaped protrusion 48a engaging the outer stop ridge 66. The inclined ramp module 12 is pressed downwardly until the bottom of the inclined ramp module 12 engages the straight, planar upper riding or support surface 34 of the straight ramp module14.

[0066] Where the vertical stacking is an inclined ramp module 12 on a straight ramp module 14, connectors 52 will be applied to the T-shaped protrusions on both side walls 36a, 36b and the front end wall 38a. Where a straight ramp module 14 is stacked on top of another straight ramp module 14, then connectors 52 will be applied to each of the T-shaped protrusions on both side walls 36a, 36b and both end walls 38a, 38b.

[0067] In the event, it is desired to double the width of the ramp assembly 10, a second straight ramp module 14 will first be secured side-by-side to the first straight ramp module 14 with the opposite side wall 36b located next to the side wall 36a. Here the T-shaped protrusions 40a, 42a will be connected with the T-shaped grooves 44b, 46b and the T-shaped grooves 44a and 46a will be connected with the T-shaped protrusions 40b, 42b. Now the connectors 52 will be located over the T-shaped protrusions 40a, 42a and in a generally clearance fit in the related T-shaped grooves 44b, 46b. The clearance between the upper end of a T-shaped protrusion 48b and the upper end of a T-shaped groove 32 can be readily seen in Figures 18 and 19. Now the inclined ramp module 12 will be assembled onto the first straight ramp module 14, as noted. Next a second inclined ramp module 12 will be placed on top of the second straight ramp module 14 with the T-shaped protrusions 22b, 24b on side wall 18b

located in the T-shaped grooves 26a, 28a on side wall 18a and also with the T-shaped protrusions 22a, 24a on the side wall 18a located in the T-shaped grooves 26b, 28b on the side wall 18b. In addition further stacked connection could be provided between the side-to-side surfaces utilizing connectors 52 between the T-shaped protrusion 40b and 42b on the straight ramp module 14 and the T-shaped protrusions 22b and 24b on the inclined ramp module 12. It can be seen, however, that the straight ramp module 14 can be connected side-by-side with two side walls 36a or two side walls 36b connected together by simply rotating the second ramp module 14 by 180°. This will bring the T-shaped protrusions 22a, 24a and the T-shaped grooves 26a, 26b on the second side wall 18a in alignment with the T-shaped grooves 26a, 26b and T-shaped protrusions 22a, 24a on the first side wall 18a. The same versatility is true in connecting one end wall 38a to another end wall 38a or 38b to 38b for end-to-end connection.

[0068] As can be seen from Figures 1 and 2, the ramp system of the present invention permits the user to create ramp assemblies of varying configurations. An example of one such ramp assembly 10 is shown in Figure 1. Here a first inclined ramp module 12 is connected end-to-end with a first straight ramp module 14 at ground level. This is done simply by slidably moving the T-shaped protrusion 48b on the end wall 38b into the T-shaped channel groove 32 on the end wall 20 and at the same time moving the T-shaped channel groove 50b on the end wall 38b over the T-shaped protrusion 30 on the end wall 20. In this regard a similar connection could be made with the end wall 38a. Next the overall length can be extended by connecting a second straight ramp module 14 end-to-end with the first straight ramp module 14 at ground level. This is done similarly to the above by placing the T-shaped protrusion 48b on the

rear end wall 38b into the T-shaped channel groove 50a on the front end wall 38a and slidably moving the T-shaped channel groove 50b on the rear end wall 38b over the T-shaped protrusion 48a on the front end wall 38a.

[0069] Now a second inclined ramp module 12 is placed on the upper riding or support surface 34 on the first straight ramp module 14. These stacked ramp modules 12 and 14 are then connected together by use of the connectors 52. Looking now to Figures 10-12, connectors 52 are located over the upper ends of the T-shaped protrusions 40a, b and 42a, b on the side wall 36a of straight ramp module 14 and on the T-shaped protrusion 48a on the front end wall 38a.

[0070] Now to extend the height of the ramp assembly 10 as shown a third straight ramp module 14 is located on the planar upper support surface 34 of the second straight ramp module 14. As this is done the T-shaped channel groove 50b and T-shaped protrusion 48b on the rear end wall 38b of the second straight module 14 are interconnected with the T-shaped protrusion 30 and T-shaped channel groove 32 on the front end wall 20 of the second inclined module 12. At the same time connectors 52 have already been located on the upper ends of the T-shaped protrusions 40a, b and 42a, b of the second straight module 14 and are moved into the lower ends of the aligned T-shaped protrusions 40a, b and 42a, b on the third straight module 14. This is done by moving the lower or bottom end of the T-shaped protrusions 40a, b and 42a, b over the upper section 62 of the connectors 52 against the outer stop ridge 66.

[0071] Now the assembly 10 is completed by locating a third inclined ramp module 12 on the planar upper support surface 34 of the third straight ramp module 14. Again the connectors 52 are first located over the upper ends of the T-shaped

protrusions 40a, b and 42a, b and the T-shaped protrusions 22a, b and 24a, b are located over the upper section 62 of the connectors 52 to secure the modules together.

[0072] The outer edge of the riding or support surface 16 at the end wall 20 of the inclined ramp modules 12 and the outer edges of the riding or support surface 34 at the end walls 38a, b of the straight ramp modules 14 are arcuately formed to avoid stress. Such arcuate outer edges 86 and 88 are shown in Figure Ia. In order to cover the slight gap between the adjacent edges 86 and 88 at the juncture of the end walls 20 and 38b, the inclined riding or support surface 16 of the inclined module 12 is provided with a somewhat flexible, generally tapered lip 90 at its lower, front end. This provides for a relatively smooth transition between the two adjacent inclined support surfaces 16 on the lower and upper inclined ramp modules 12 so as to render the gap between the adjacent edges 86 and 88 substantially imperceptible to the user.

[0073] Figure 2 shows examples of the variety of horizontal and vertical interconnections between the inclined ramp modules 12 and straight ramp modules 14 to provide a selective variety of modular ramp assemblies generally indicated by the numeral 10'. As noted a number of the inclined ramp modules 12 and straight modules 14, are shown in phantom to indicate the variety of interconnections for different ramp assemblies. Thus the same end user can have the versatility of setting up ramp assemblies of different configurations for different objectives and even different uses, i.e. inline skates, skateboards, etc. This then allows the user to set up ramp assembly obstacle courses with different degrees of challenge.

[0074] Both the inclined upper riding or support surface 16 on the inclined ramp module 12 and the straight planar upper riding or support surface 34 on the

straight ramp module 14 can be roughened to enhance gripping of the engaging rolling member such as bike tires, skate rollers, etc. and to assist in traction and to inhibit slippage especially if wet. In one form, the roughened surfaces were formed in molding. However, it should be understood that such roughened surfaces could be created after molding. In this regard, it can be seen in Figure 7 that in some forms of a ramp assembly the planar upper support surface 34 of at least one straight ramp module 14 will be exposed for engagement by the rolling member. For purposes of simplicity of the drawings only the inclined ramp module 12 in Figures 3 and 4 and straight ramp module 14 in Figure 7 are shown with roughened surfaces.

[0075] As noted, both the inclined ramp modules 12 and straight ramp modules 14 are of a hollow construction and as such are designed to be molded from a plastic material. In one form of the invention the plastic material was a high density polyethylene (HDPE). In this regard, the connectors 52 can be molded from the same material.

[0076] In order to facilitate molding of the inclined ramp modules 12 and straight ramp modules 14 and to provide modules that are relatively light weight, a hollow structure is provided with numerous internal ribs.

[0077] Such a structure for the inclined ramp module 12 can be seen in the longitudinal section of Figure 3a. There, a plurality of longitudinally extending main ribs 92 connect the inclined riding or support surface 16 with the end wall 20. Only one rib 92 is shown for purposes of simplicity. At the same time a plurality of transverse main ribs 94 are connected between the inclined support surface 16, the side walls 18a,

18b, and the longitudinal ribs 92. The center portions of the ribs 92 and 94 are of a reduced vertical length while the sides extend to the bottom.

[0078] The internal structure for the straight ramp module 14 can be seen in Figures 7a and 7b. Figure 7a shows a plurality of longitudinally extending main ribs 96 which connect the riding or support surface 34 with end walls 38a, b. Figure 7b shows a plurality of transversely extending main ribs 98 which connect the support surface 34 with the side walls 36a, b and are interconnected with the longitudinal ribs 96. Again the center portions of the ribs 96 and 98 are of a reduced vertical length while the sides extend to the bottom. These structures facilitate the molding process and the production of the inclined modules 12 and straight module 14 of a lightweight structure.

[0079] In one form of the invention the inclined module 12 and straight module 14, generally of the construction noted, each has five generally equally spaced longitudinal main ribs 92 and 96, respectively, and five generally equally spaced transverse main ribs 94,98, respectively. As noted the longitudinal main ribs 92 and 96 extend for substantially the full length of the ramp modules 12 and 14 while the transverse main ribs 94 and 98 extend for substantially the full width of the ramp modules 12 and 14. In addition, the Inclined module 12 has four longitudinal rib segments 93 in between the five longitudinal main ribs 92 and four transverse rib segments 95 in between the five transverse main ribs 94. The rib segments 93 and 95 are also connected to the support surface 16 but do not extend for the full length or full width of the inclined ramp module 12. Similarly, each of the straight ramp modules 14 has four longitudinal rib segments 97 In between the five longitudinal main ribs 96 and four transverse rib segments 99 in between the five transverse main ribs 98. The rib

segments 97 and 99 are also connected to the planar support surface 34 but which do not extend for the full length or full width of the straight ramp module 14.

[0080] As can be seen the overall strength and rigidity of the riding or support surfaces 16 and 34 are thereby substantially enhanced. Also it can be seen that the outer lower ends of the main ribs 92 and 94 of the inclined ramp module 12 and the main ribs 96 and 98 of the straight ramp module 14 extend to the bottom of the respective ramp modules 12 and 14. These then provide a distributed support surface against the ground or when engaged with the riding or support surfaces 34 when in a stacked condition.

[0081] In this regard, in one form of the invention the inclined modules 12 and straight modules 14 where made with side walls 18a, b and 36a, b of the same longitudinal length (Li, Ls), and end walls 20 and 38a, b of the same transverse width (Wi, Ws), and of the same vertical height (Hi, Hs). As such in one form, the longitudinal length (Li, Ls), was around 36 inches, the transverse width (WI, Ws) was around 25.5 inches and the vertical height (Hi, Hs) was around 12 inches. In this regard, the tapered lip 90 extends longitudinally slightly past the length Li of side walls 18a, b at the lower end to provide the desired coverage of the gap between the confronting edges 86 and 88 of the adjacent end walls 20 and 38b. Also in this form the angle of inclination AI of the riding or support surface 16 of the inclined module 12 was selected to be around 19°. With such a structure the support surfaces 16 and 34 and main ribs 92, 94, 96 and 98 could be made of a relatively small gauge or thickness. As such the support surfaces 16 and 34 could be made around .140 inches thick; the side walls 18a, b and 36a, b and end walls 20 and 38a, b could be made around .100 inches thick; and the main ribs 92,

94, 96 and 98 could be made around .060 inches thick. The rib segments 93, 95,97 and 99 could be of the same thickness as the main ribs 92, 94, 96 and 98. Some of the above structures would be somewhat slightly tapered to facilitate molding. Such hollow, relatively thin wall constructions can produce generally lightweight ramp modules, i.e. around 17 pounds for the straight module 14 and around 11 pounds for the inclined module 12. Yet it is believed that the constructions as noted can safely handle loads at least up to 300 pounds.

[0082] In order to provide resistance to slippage on the ground level a foot member can be provided to be selectively placed on portions of the bottom ends of the side walls 18a, b and 36a, b and the end walls 20 and 38a, b. Such a foot member 100 can be seen in Figure 7c as applied to side wall 36a and in Figure 7d prior to application to a side wall 36a. Here the foot member 100 is provided of a generally U-shaped cross-section having an open channel 102 which is of a size to be snugly located on the bottom end of the outer side walls and outer end walls of the inclined ramp modules 12 and straight ramp modules 14 of a ramp assembly.

[0083] Looking now to Figure 7d the U-shaped foot member 100 has a substantially wider bottom engagement segment 104 to provide a desired amount of surface contact with the surface on which the ramp assembly 10 is located to inhibit slippage. The foot member 100 has a lower section 106 which is of a generally uniform wall thickness and is connected to an upper tapered section 108 of varying reduced wall thickness. At the same time an upper open end 110 of the foot member 100 is partially closed while the lower end 112 is of a width substantially the same as the wall thickness of the outer side walls 18a, b and 36a, b and outer end walls 36a, b. Thus the foot

member 100 can be resiliently moved through the open end 110 onto the outer side walls 18a, b and 36a, b and end walls 38a, b with the upper section 108 closing to grip the side walls and end walls to assist in retaining the foot member 100 in place. In addition the foot member 100 can also be applied to the outer lower ends of the main ribs 92, 94, 96 and 98. In this regard, the main ribs 92, 94, 96 and 98 are of a lesser thickness than that of the side walls 18a, b and 36a, b and end walls 20 and 38a, b. This will provide a clearance with the lower end 112 of the channel 102. However, the open end 110 of the foot member 100 will still be moved apart resiliently upon application over the main ribs 92, 94, 96 and 98 and will be closed to grip the main ribs 92, 94, 96 and 98 to retain the foot member 100 in place. The foot member 100 is also made of a generally resilient, elastic material such as an EPDM rubber of around 75 to around 80 durometer whereby discontinuities in the ground supporting surface can also be substantially accommodated. The foot member 100 can be simply made of strips which can be cut to preselected limited lengths to fit the accessible portions at the bottom ends of the outer side walls 18a, b and 36a, b and outer end walls 38a, b. It could also be applied to the end wall 20 only where a single inclined ramp module 12 is used alone. In one form, the engagement segment 104 was made around .30 inches wide. For purposes of simplicity the foot member 100 is shown only applied to the straight ramp module 14 in Figures 7a and 7b. It should be understood that the foot member 100 may not need to be applied to each of the multiple locations as shown. It should be noted that even where the foot member 100 is not applied to the main ribs 92, 94, 96 and 98, there could still be ground contact by the lower ends of the main ribs when riding load is being applied as the foot member 100 elastically deforms.

[0084] Thus it can be seen that the ramp assemblies of various configurations can be readily assembled and disassembled by vertical sliding movement to engage or disengage the T-shaped protrusions from the T-shaped channel grooves and a simple type of action for stacking or unstacking the ramp modules.

[0085] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.